First Simulation

Sheet 1

Use the calculator to simulate one throw of the 5 dice. Type the function randInt(1,6,5), [ENTER].

Example

```
randInt(1,6,5)
     {2 6 5 2 2}
■
```

Let 1, 2, 3 represent the sides with CAR & 4, 5, 6 the money.

For this trial, we have CAR on the first die, money on the second and third dice, and CAR on the fourth and fifth dice. So we did not win the car.

Repeat this simulation 10 times. (There is no need to type everything in again; just press [ENTER] each time.)

1. How many times did you win a car?

2. Now pool the class results.
   - # of trials (# students × 10)
   - # of cars won
   - P(winning a car with one toss of all 5 dice)

Second Simulation

Use the calculator to simulate three throws of the 5 dice. Type the function randInt(1,6,5), [ENTER], [ENTER], [ENTER].

Example

```
randInt(1,6,5)
     {6 6 1 1 5}
     {6 4 2 1 6}
     {2 3 1 2 6}
█
```

Let 1,2,3 represent the sides with CAR & 4,5,6 the money.

For this example, we have one of the CAR dice in positions 3 and 4 on the first throw, in positions 1 and 2 on the third throw, but not at all in position 5. So, we did not win the car—but we were close!

Play the game 10 times.
Each time, record the number of CARs you have after each roll.
NOTE: Since you keep each CAR that you previously rolled, this number should never decrease.

	Number of dice that say CAR		
Game #	. . . after 1st roll	. . . after 2nd roll	. . . after 3rd roll
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Second Simulation (continued)

Sheet 2(b)

Use the data in the completed chart on sheet 2(a) to answer the questions.

1. What proportion of your dice *eventually* said CAR?

2. Now pool the class results.
   # of trials (# students × 10)

   # of dice that eventually said CAR

   P(a die eventually says car)

3. How many times did you win the car?

4. Now pool the class results.
   # of trials (# students × 10)

   # of cars won

   P(winning a car with three throws of the 5 dice)

Mathematical Theory

Sheet 3(a)

Use your experiences from the simulations to answer the following questions. Explain your answers.

1. If you roll one die 1 time, what is the probability you roll a car?

2. If you roll one die 3 times, what is the probability you *never* roll a car?

3. What is the probability that, in 3 rolls of one die, you will eventually roll a car?

4. Let x represent the number of dice (out of the 5) in "Let 'Em Roll" that eventually show a car after 3 rolls. What is the probability distribution of x?

5. What is the probability that all 5 dice eventually show a car? (That is, what is the chance of winning "Let 'Em Roll"?)

Mathematical Theory (continued)

Suppose you have rolled the dice twice, and you have four cars showing. The fifth die shows $1,500. Should you keep the $1,500 or roll that last die?

6. What is the *probability* you will win the car if you roll the last die one more time? Based on this result alone, would you roll the die?

Consider the problem from the *expected winnings* perspective.

7. Suppose you roll that last die. What are the probabilities of rolling $500? $1,000? $1,500? A car?

8. Suppose the car is worth $15,000. Let y equal your winnings after the last roll. Based on the previous question, write down the probability distribution of y.

9. Find the expected value of y.

10. Compare this expected value to the $1,500 you have in hand (assuming you don't roll the last die). Based on expected payoff, would you roll the last die?

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